2016
(January)

Time : 3 hours

Full Marks : 80

The figures in the right-hand margin indicate marks.

Answer from both the Sections as per direction.

(CLASSICAL MECHANICS)

Section – A

1. Answer any **four** of the following : **4×4 = 16**

   (a) Explain the inertia tensor and the moment of inertia.

   (b) Explain principle axis transformation.

   (c) Explain the physical significance of Hamiltonian.

   (d) State and explain Poisson's Theorem.

   (e) Explain the motions of particle under inverse square force as the case of a Kepler's problem.

(b) Define normal modes and normal coordinates and discuss the application of group theory to normal model.

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(f) Briefly explain the general theory of small oscillations.

OR

2. Answer **all** questions from the following : 2×8 = 16

(a) What do you mean by rate of charge of vector ?

(b) Define heavy symmetrical top.

(c) Explain holonomic and non-holonomic systems.

(d) Explain types of generating function.

(e) Distinguish between Poisson and Lagrange brackets.

(f) Explain Kepler's Law.

(g) Define normal coordinators of vibration.

(h) What is torque ? Explain.

Section – B

Answer **all** questions : 16×4 = 64

3. (a) With a neat diagram, explain Euler's angles. Derive Euler's equations for the motion of a rigid body and explain the significance of these equations.

OR

(b) What is Coriolis effect ? Discuss its effects on natural phenomena. Explain the torque free motion of a rigid body.

4. (a) Explain some techniques of the calculus of variations. Discuss the Hamilton's principle.

OR

(b) State and explain variational principle and derive the Hamilton's equations of motions from variational principle.

5. (a) Explain canonical transformations with examples. Discuss the relation between canonical transformations and fundamental Poisson brackets.

OR

(b) Explain Hamilton-Jacobi Theory. Find the amplitude of a harmonic oscillator using Hamilton-Jacobi Theory.

6. (a) Explain the principle axis transformation in the theory of small oscillations.

OR